SITE INSPECTION
of the
BLOEDE MANUFACTURING PROPERTY
Baltimore City (MD-466)

Volume I

October 1995

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MARYLAND DEPARTMENT OF THE ENVIRONMENT
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SITE ASSESSMENT/STATE SUPERFUND DIVISION

ORIGINAL
(Red)

SITE INSPECTION
FOR
BLOEDE MANUFACTURING PROPERTY
(MD-466)

Report in 2 Volumes:

Vol. I Site Inspection (SI) for Bloede Manufacturing Property

Vol. II ESI - CLP Data.

October 1995

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Table of Contents

1 INTRODUCTION

1.1 Authorization

This Site Inspection (SI) was performed by the Maryland Department of the Environment, Waste Management Administration (MDE/WAS), Environmental Restoration and Redevelopment Program (ERRP), Site Assessment/State Superfund Division under Cooperative Agreement Number V-993199-01-0 with the U.S. Environmental Protection Agency (EPA). The EPA ID number for this site is MDD985423342.

1.2 Scope of Work

The MDE/WAS ERRP Site Assessment Division was contracted by EPA to perform a SI of the BLOEDE Manufacturer Property located in Baltimore City (Figure 1).

The purpose of the SI is to evaluate the actual and potential release of hazardous waste from the site by way of surface water pathway and soil exposure. The populations and sensitive environments, which may be impacted, are discussed according to the toxicological criteria.

The scope of SI involved sample collection under the U.S. EPA Contract Laboratory Program (CLP), laboratory analysis, and interpretation of available data to determine if additional action under CERCLA is required.

1.3 Executive Summary and Conclusion

The inactive Bloede Manufacturing site (MD-466) is located in southwestern Baltimore City. The 6.5 acre site is located in the 700 block of Caton Avenue, in a predominantly commercial area with scattered residential dwellings.

The Bloede Manufacturing site is a former glue and adhesives production plant which operated from approximately 1934 until 1956. During its operational period, the owner allegedly disposed of some of its chemical wastes on-site. However, no records exist regarding the waste disposal practices of the company. As a result, the type, place, and quantity of chemical wastes disposed of on-site is not known. Information obtained from interviews with former Bloede employees indicated that the bad batches of glue, which were stored in 55-gallon drums, were dumped over the hill on the south side of the property, towards Maiden Choice Run. Some of the constituents that made up the glue

were formaldehyde, sulfuric acid, and caustic soda. The buildings that once existed on site have been abandoned, demolished, or destroyed by fire.

The chemical analyses performed on samples collected during this Site Inspection indicate the following:

- Concentrations above the Superfund Chemical Data Matrix (SCDM), Cancer Risk Concentration Screen, Version 1994 benchmark for:

    i. Benzo(a)Pyrene in soil sample S-1 (Tab. 10);
    ii. Dieldrin in soil sample S-6 (Tab. 10);
    iii. Beryllium in soil sample S-1 (Tab. 9);

- Concentration above the Ambient Water Quality Criteria, Version 1994 benchmark for:

    iv. Iron in surface water sample SW-3 (Tab. 11);
    v. Lead in surface water sample SW-3 (Tab. 11).

- Numerous organic and inorganic constituents with concentrations greater than three times the available background values.

Maidens Choice Run -- which is a natural boundary on the southwestern side of the Bloede property -- flows in a southeast direction for an estimated 0.6 miles to its confluence with Gwynn Falls.

The exposure scenario of greatest concern to the nearby residents or on-site trespassers is the incidental ingestion of, and dermal contact with, soil at the site. In addition, the ingestion of aquatic life from the Gwynn Falls, by local sustenance fisherman is a potential concern.

Significant targets include wetlands along the Gwynn Falls -- a recreational fishery -- which flows 0.6 mile southeast of the site.

Based on the results of this Site Inspection, MDE recommends that the federal CERCLA program not pursue further action with regards to the Bloede Manufacturing Property site.

2 SITE DESCRIPTION

2.1 Site Location

The Bloede Manufacturing Property is located in the 700 block of Caton Avenue in Baltimore City, Maryland (See figures 1,2, and 3). The geographic coordinates of a central point of the site are 39° 17' 15" west latitude and 76 40' 30" north longitude. The Maryland grid coordinates for the same point are 525,800 feet north by 892,150 feet east.[1]

From the MDE office in Baltimore, directions to the Bloede Manufacturing site would be as follows: Take Route 95 south towards Washington D.C. for approximately 6 miles until you reach exit 50, Caton Avenue. Take Caton Avenue north for about 1 mile, cross over Wilkins Avenue and travel an estimated one-half mile to the 700 block of Caton Avenue. The site is located on the left hand side of the road just beyond the Primrose Place Convalescent Center. Total one way distance from MDE to the site is approximately 8.5 miles.[2]

2.2 Operational History

The Bloede Manufacturing property is located on a 6.5 acre parcel of land in an urban area of southwest Baltimore City. The area contains manufacturing, commercial and residential buildings with St. Agnes Hospital, a major health care facility, located just south of the site. Bloede was a glue and adhesives production plant which operated from approximately 1934 until 1956 when the property was sold to National Starch Products, Incorporated. Most of the buildings that once existed on site have since been abandoned, demolished, or destroyed by fire. The site is now grown over by woods and other vegetation; however, the road leading into the property is still accessible and has been used by unlicensed trash haulers for the disposal of residential and commercial solid waste.

Table 1 - Operational History of the Bloede Manufacturer site

Period	Owner	Operational Record
1934(?) - 1956	Bloede Manufacturing	Glues and Adhesives
1956 - 1971	National Starch Products	NA
1971 - 1987	Albert G. Aaron	NA
1987 - 1989	Madeline G. and Louis E. Burriss	NA
1989 - present	P.F.Obrecht and Associates (Limited Partnership)	inactive

2.3 Current Site Use

The Bloede property is currently inactive. The current status of the site, according to the site visits performed by the MDE in 1994 and 1995, is as follows (Figure 6):

- a vacant area (approximately 2 acres) near to the Caton Avenue;
- numerous waste piles containing wooden pallets, rubble fill, scrap metal, brick/block from the demolished buildings, burned railroad ties, parts of electric transformers, stumps, and household debris located on the northwestern section of the property;
- a rusted 500-gallon petroleum product tank;
- several standing parts of the structures which were destroyed by a fire. Some asbestos materials are said to be present in this area of the site;[18]
- a wooded area along the Maidens Choice Run, which crosses the site on the southeastern part;
- no monitoring wells on site.

2.4 Permitting and Regulatory Actions

No State permits were ever issued to Bloede Manufacturing. Also, the Department has no regulatory files concerning this facility.

2.5 Remedial Action

To date, no CERCLA removal or remedial action has been taken at the Bloede Manufacturing site. In 1989, Power Components Systems, Inc. was hired by the current site owner to remove most of the asbestos material.[18]

3 ENVIRONMENTAL SETTING

3.1 Water Supply

Both surface water and groundwater sources are used for water supply in this area. Liberty Reservoir, which is located approximately 15 miles upstream of the site, lies along the border between Carroll County and Baltimore County. This reservoir has a capacity of 43.33 billion gallons of raw water. An average of 90 to 120 million gallons per day is withdrawn from this reservoir and treated at the Ashburton Filtration Plant. This facility provides pre-chlorination, flocculation, sedimentation, filtration, and disinfestation for the municipal water supply.

Private wells serve approximately 150 persons living within four miles of the site. This estimate is based upon permit well records of private wells drilled during the last 25 years. The distribution of population served by wells is shown in Table 2.

Table 2 - Distribution of population served by wells.

Distance from the site (miles)	**Population served by domestic wells**
0 - 0.25	0
0.25 - 0.5	0
0.5 - 1	0
1 - 2	10
2 - 3	24
3 - 4	94
Total	128

This estimate is based upon information provided by the database of the MDE/Residential Sanitation Program and an average of 2.4 persons per dwelling for Baltimore City.

3.2 Surface Water

The site slopes down gently from north to south and varies in elevation from about 135 feet in the northwest portion to about 110 feet in the southeast section, where it slopes steeply towards Maidens Choice Run.[3] A narrow deep valley, which has been carved by this small stream, crosses the southeastern part of the site. A sewer manhole/access is

located approximately 10 feet above the ground adjacent to the left bank of Maidens Choice Run. This is indicative of the scouring and erosion in this section of the stream.

Generally, overland surface water runoff from the Bloede property flows in a southeast direction for approximately 50 feet, over a steep grade and enters Maidens Choice Run. There is no well defined on-site drainage route to the probable point of entry (PPE). Maidens Choice Run, classified as a small stream, is the PPE for overland surface water runoff from the site (see Figure 5).

Maidens Choice Run flows in a southeast direction for an estimated 0.6 miles to the confluence with Gwynn Falls.

Table 3 - The surface water migration pathway main characteristics[12]

From	To	Distance from the PPE *(miles)*	Approximate Flow Rate of the Contiguous Stream *(cf/s)*
Overland Flow	PPE - Maidens Choice Run	0.01	<10
Maidens Choice Run	Gwynn Falls	0.60	10 - 100
Gwynn Falls	Middle Branch of the Patapsco River	1.25	100 - 1,000
Middle Branch of the Patapsco River	Patapsco River	3.25	1,000 - 10,000
Patapsco River	Chesapeake Bay	10.5	>10,000

The Gwynn Falls is described as a riverine permanent tidal and estuarine subtidal, open water wetland. Approximately 1.85 miles downstream of the PPE -- along the Middle Branch of the Patapsco River -- are 1.25 frontage miles of estuarine intertidal, flat emergent narrow-leaved, and beach bar, regular and irregular wetlands.

The Middle Branch of the Patapsco River is described as a estuarine subtidal open water wetland.

There are numerous wetlands along the Patapsco River downstream from its convergence with the Middle Branch of the Patapsco River to the Chesapeake Bay. These wetlands are described as estuarine persistent. The Patapsco River is described as a estuarine intertidal, subtidal, open water wetland.

All bodies of surface water associated with the surface water pathway for the site are considered designated fisheries. The Middle Branch and the Patapsco River are also used for recreational boating and swimming.

Carroll Park, not considered a sensitive environment, is located approximately 2 miles downstream from the site.

3.3 Soils

A soil survey map of the site area is not available. Most of the indigenous soil appears to have been modified by construction.

The soils known in the proximity -- less than a mile southwest of the site in Baltimore County -- appertain to two associations:

1 Loamy and clayey land Lenoir-Beltsville association: Nearly level to steep land of sandy loam to clay loam over clay and somewhat poorly drained and moderately well drained soils that have a subsoil of dominantly silty clay loam and silt loam, underlain by thick stratified sediment on uplands;

2 Legore-Aldino-Neshaminy association: Gently sloping to steep, deep, well-drained soils that have a subsoil of silty clay loam or clay loam and level to moderately sloping, moderately well drained soils that have a subsoil of silty clay loam and a fragipan; underlain by basic rock on uplands.

The predominant soils at the site may be characterized as moderately-fine textured soils with low infiltration rates.

3.4 Geology

3.4.1 Physiographic Province

The Bloede site lies on the northeastern bank of the Maiden Choice Run, approximately 0.6 miles northwest of its confluence with the Gwynn Falls in Baltimore City. This area relates to the Fall Line, which separates two major provinces: the Piedmont to the west, and the Coastal Plain to the east. The Piedmont province consists of metamorphosed igneous rocks and to a lesser extent sedimentary rocks. The Coastal Plain consists of unconsolidated layers of Triassic to Quaternary sand, gravel and clay overlying the crystalline bedrock of the Piedmont province.

Generally the layers dip and thicken to the southeast, from zero feet at the Fall Line to more than 8,000 feet at the Atlantic Coast.

3.4.2 Rock Types

There are five geologic formations that are relevant to the site. Table 4 shows the main lithologic characteristics of these formations.

The Potomac Group includes three formations which were deposited in a river-delta environment. This means that individual lithologic units are not readily traceable, even over short distances, because the sediments have little lateral continuity. The man made fill formation covers at least 2 acres of the site area.

Table 4 - The geologic formations relevant to the site.

Formation		Age	Lithology
Man Made Fill			
Recent deposits		Holocene Pliocene Pleistocene	Quartz sand, gravel, silt and clay (kaolinite and illite)
Potomac Group	Patapsco	Cretaceous	Quartz sand, interbedded with lenses of clay (kaolinite and illite)
	Arundel Clay		Variegated layers of clay with sand lenses
	Patuxent		Quartz-rich sand and gravel, interbedded with discontinuous lenses of clayey schist
Piedmont Basement Complex			Metamorphosed sedimentary and igneous rocks

Alluvial deposits are near surface layers of sands, gravels, and clays. Artificial fill is man made debris. A geologic map of the surrounding areas of the site is shown on Figure 8.

3.5 Groundwater

3.5.1 Aquifer Delineation

The following remarks have been made based on the available boring logs in the area:

- The average depth of the existing wells in a 4-mile radius of the site is approximately 35 feet and does not exceed a depth of 320 feet. Well # BC 73 0010 (test well), located on Light Street, approximately 3.2 miles of the site, has the greatest depth, 320 feet. The deepest domestic well is Well # BA 73 0168, located 3.5 miles northwest of the site, and has a depth of 180 feet;

- The depth of the shallow aquifer generally ranges from 2 to 40 feet;

- The shallow aquifer, which is the aquifer of concern in this area, was encountered in all wells.

The horizontal extent of the aquifers is not well known.

The site is located in the 100 year flood plain. [26] There is no flood containment for the Maidens Choice Run floodplain in which the source is wholly located.

All the geologic units in the surrounding area of the site are considered to be hydrogeologically interconnected with one another as well as with the overlying alluvial deposits. The surface water streams are interconnected with the underlying aquifers and thus the water sources are not separable.

3.5.2 Hydrogeologic Units

Most of the domestic wells in the area are screened in the Potomac Group. The water bearing strata in the Potomac Group in this area are the Patuxent and Patapsco Formations.

The Patuxent Formation - which underlies the Patapsco - is very similar to the Patapsco in that it is also composed of lenses of sand and clay. However, the sands of the Patuxent are more micaceous and arkosic than those of the Patapsco. The average yield of 17 wells screened in the Patuxent Formation is 16 gpm with the specific capacity averaging 1.1 gpm/ft. Approximately half of these wells lie in the Fall Zone, where streams have cut through the Patuxent Formation to bedrock, leaving isolated remnants of the formation that are only partly saturated with water. This may account for the lower yields and specific capacity.[15]

The Patapsco Formation characteristically contains lenticular bodies of cross-bedded sand, clay, and sandy clay, and consequently, is widely variable over short distances. Although wells located near one another may have to go to different depths to find a lens sufficiently permeable to yield water, the lenses are probably hydrogeologically connected. Eight wells in the Elkton area, known to yield 3 to 120 gpm from the Patapsco Formation, had an average specific capacity of 3.7 gpm/ft.[15] In general, the Patapsco

Formation's transmissivity ranges between 160 square ft/day and 6,700 square ft/day; some of the highest values known to occur in Baltimore County. Storage coefficients can be as much as 0.15 in outcrop areas where water-table conditions exist. Permeability testing was conducted on the three layers of the Patapsco Formation by The Chester Engineers in 1986. The permeability of the upper sand ranged from 8.17×10^{-6} cm/sec to 1.69×10^{-2} cm/sec. The permeability of the clay confining layer is approximately three orders of magnitude less than that of the sand above it.[12,18]

3.5.3 Aquifer Characteristics

The following are important aspects to be mentioned in terms of the aquifer in this area:

- The Bloede Manufacturing site lies within the Gwynn Falls basin. Gwynn Falls is a important fishery in this area;
- The soil in the surrounding area is generally silty. The infiltration capacity is low;
- The thickness of layers with low conductivity is estimated to be 100 ft;
- The hydraulic conductivity of the layers that comprise the Potomac aquifer ranges from $3x10^{-4}$ to $4x10^{-4}$ cm/sec;
- The site altitude is at least 10-20 feet above the lowest elevation in the south-eastern side of the site. This topographic feature facilitates groundwater flow from the site to the Maidens Choice Run.

These geologic features play a major roll in the aquifer's characteristics in this area. The aquifer characteristics are related either to the porosity of sedimentary deposits, or to the degree and extent of fracturing in bedrock, as well as to the topography and weathering.

No data regarding the weathering of bedrock in the site area is available.

3.5.4 Information Based on MDE Well Completion Database

Since 1969 the Maryland Department of Natural Resources (DNR) has required that all groundwater wells that are installed in the state of Maryland have a permit and well completion report. This data has been compiled and stored by MDE in the Well Completion Database (TSO File).[19,21]

The Site Assessment Data Retrieval shows that less than 8% of the 718 wells within the 4-mile radius have a domestic function. There are no municipal wells in a 4-mile radius of the site.

A breakdown of the permitted wells within a 4-mile radius of the site is shown in Table 5.

Table 5 - Well types within 4-mile radius of the site.

Distance Ring from the Site (miles)	Well purpose				Ring Total
	D	F	I	T	
0 - 1/4	-	-	-	-	-
1/4 - ½	-	-	-	1	1
½ - 1	-	-	-	1	1
1 - 2	4	-	-	100	104
2 - 3	12	-	3	178	193
3 - 4	41	3	3	372	419
Totals:	**57**	**3**	**6**	**652**	**718**

D = Domestic well; *F = Farming well;*
I = Industrial and/or Commercial well; *T = Test, observation or monitoring well.*

This estimate includes only the wells drilled within the last 26 years.[21]

3.6 Meteorology

The net annual precipitation at the site is estimated to be 8 inches per year. This estimate is based upon the reported mean values of 44 inches per year precipitation and the mean annual lake evaporation of 36 inches per year.

The 2-year 24-hour rainfall is approximately 3.5 inches. [27]

3.7 Nearby Land Use and Population Distribution

An eight foot fence exists along the site boundaries. An access gate from Caton Avenue is locked and posted with "No Trespassing" signs. However, the site is easily accessible to persons living in the area.

During a site visit made in 1993, MDE personnel noted an area near Caton Avenue used by trespassers for target practice, piles of construction and residential debris, a large pile of wooden pallets and a rusted 100-gal oil tank. In 1995, during the sampling event, it was noted that some of the waste materials present in 1993, as well as a part of the brick building, had been removed. In addition, some electrical transformers had been disposed on site.

The Bloede Manufacturing site is located in a area that is mostly commercial/industrial with few residential buildings. The following remarks characterize the nearby land use and population distribution around the site:

- The nearest residence to the site boundary -- the Primrose Place Convalescent Center --is located less than 1/4 mile to the south;
- The adjacent property to the north is used for commercial/industrial purposes;
- There are no residences, schools, or day care centers located within 200 feet of the site boundaries;
- There are no terrestrial sensitive environments located on site;
- There are no designated wetland areas located on site or within 1/4 mile of the site property;
- There is less than 1 acre of palustrine scrub/shrub broad-leaved deciduous/emergent narrow leaved persistent wetlands located between the 1/4 to ½ mile radius segment of the site.

An estimated 86,802 persons reside within a 4-mile radius of the site. This estimate is based upon house counts from USGS 1:24,000 topo maps and an average of 2.4 persons per dwelling for Baltimore City.

In addition to the house count, the target population area is approximately 75% urban (urban shading on topo map), which increases the population count dramatically.

The potential population by distance around the site is given in Table 6.

Table 6 - Population distribution around the site.

Distance from the site (miles)	**Residential Population in the Ring**
0 -1/4	155
1/4 - ½	631
½ - 1	3,580
1 - 2	19,545
2 - 3	30,120
3 - 4	32,771
Total	86,802

4 WASTE DESCRIPTION

Bloede Manufacturing operated for approximately 22 years producing different types of glues and adhesives. It was alleged that products that did not meet the required specifications were dumped on-site, allegedly over the hill on the south side of the property towards Maiden Choice Run (Figure 6). Some of the constituents that made up the glue were formaldehyde, sulfuric acid, and caustic soda. Although there are no records available to determine the type, quantity, and location of waste chemical products disposed at the site, it is assumed that during 22 years potentially large quantities of waste could have been dumped on-site.

The following are important characteristics at this site:

- The area covered by the waste products dumped on site is estimated to be 0.25 acres;
- Area of suspected contamination is surrounded by a maintained fence. However, there is evidences of trespassing (numerous shot gun shell casings);
- No liner exists at this site;
- No monitoring wells exist at this site;
- The entire site is heavily vegetated with essentially no exposed soil, and the cover soil is resistant to gas migration;
- Distance to the nearest domestic well is 1 mile.

Currently, numerous waste piles containing wooden pallets, rubble, scrap metal, brick/block from demolished buildings, burned railroad ties, parts of electric transformers, stumps, and household debris are located on the northwestern section of the property. In addition, a rusted 500-gallon petroleum product tank and several standing parts of the structures which were destroyed by a fire have been noticed on site. Some asbestos products are said to be present in this area (the northern section of the site).

5 PREVIOUS STUDIES

5.1 Environmental Management Group, Inc., 1989

P. F. Obrecht and Associates contracted with the Environmental Management Group, Inc. to complete an inspection of asbestos material that was observed in one of the buildings on site.

Approximately 25 linear feet of asbestos containing building material (ACBM) in the form of steam pipe insulation was located in the Quonset Hut building. Additionally, two 1-foot strips of ACBM were found in one of the four structures which were on site.

In October 1989, Power Components Systems, Inc. was hired and removed the asbestos material.

5.2 National Foundation Engineering, Inc., 1989

In July 1989, National Foundation Engineering, Inc. (NFE) performed a subsurface investigation at the site. The investigation included five soil samples to determine the presence of hazardous waste. While the chemical analyses of these samples indicated that there was no hazardous waste present on site, NFE personnel had observed a strong foul odor in some of the samples. As a result, six additional borings were drilled in an attempt to locate the foul odor and test for heavy metals. No foul odors were observed, and very low levels of lead and cadmium were detected. In summary, NFE concluded that the site did not contain hazardous materials.

6 SITE INSPECTION CONTRACT LABORATORY PROGRAM SAMPLING

The Bloede Manufacturing Property Site was sampled by MDE/WAS Site Assessment/State Superfund Division personnel on April 12, 1995. All samples were collected and submitted -- in accordance with the USEPA Contract Laboratory Program (CLP) Routine Analytical Services (RAS) -- to the Central Regional Laboratory in Annapolis, Maryland, under Lab Request Number REQ95087.

The samples were collected in four sample matrices: organic aqueous, organic soil (soil & sediment), inorganic aqueous, and inorganic soil. Each matrix included the collection of a field duplicate sample and the required matrix spike volume. In addition, each aqueous matrix was provided with a field blank sample which consisted of deionized water poured into the sample containers in the field during the sampling event, and then submitted for analysis with the appropriate aqueous matrix. A spike volume, a duplicate and a blank sample were also collected and filtered. A trip blank sample consisting of two VOAs was included with shipment.

Table 7 - The sample collection log

Sample ID#	Media	Location	Rationale
S-1	solid	Empty lot, north of site	Background sample
S-2	solid	Southwest corner of the property	Source characterization
S-3	solid	South-central part of the property	Source characterization
S-4	solid	Central part	Source characterization
S-5	solid	Northwest part	Source characterization
S-6	solid	North-central part	Source characterization
S-7	solid	South-central part	Duplicate sample (S-3)
SW/SED-1	aqueous	Upstream, Maidens Choice Run	Background sample
SW/SED-2	aqueous	South of site, Maidens Choice Run	Indicate if source contaminants (SC) have entered fishery
SW/SED-3	aqueous	Southeast of site, Maidens Choice Run	Indicate if SC have migrated along fishery
SW/SED-4	aqueous	Southeast of site, Gwynn Falls	Migration of SC to fishery
SW/SED-5	aqueous	same as SW-2	Duplicate sample (SW-2)

6.1 Remarks Concerning Sampling

The following sections outline the significant results of sample analysis. In the discussion of results, a contaminant level will be considered "significant" if several criteria are met. These include:

1) A level is found to be significantly (>10X) above blank levels;
2) A level is found to be significantly (>3X) above background levels;
3) A level is found which is considered to be otherwise outside normal, native levels (for soils and sediment, higher than 99% of all observations for the Eastern United States); and/or
4) A level is meeting or exceeding current, relevant benchmark levels set to protect human health and/or the environment.

All samples collected at the Bloede site were grab samples. The samples were packaged on-site and transported to Federal Express on the same day for shipment to the Central Regional Laboratory in Annapolis, Maryland.

The sampling locations are given in Figure 10.

6.2 Sampling Results

The analytical report completed on samples collected at Bloede Manufacturing (April 12, 1995) was received by MDE/WAS Site Assessment/State Superfund Division on June 27, 1995. A copy of the analytical report is given in the Site Inspection for the Bloede Manufacturing Property report Volume II (MDE, 1995).

Table 9 is a reference for recognizing the sample identification number. The tables 10 to 13 contain data related to sampling performed on November 2, 1994.

The following notations are common for all tables:

-- *Not detected above the detection limit, but analyzed;*
> *Sample value is below the quantitation limit;*
* *Superfund Chemical Data Matrix (SCDM), Reference Dose Screen Concentration, 1994;*
** *SCDM, Cancer Risk Concentration Screen, Version 1994;*
*** *EPA Region III, Risk Based Concentration Table: R.L.Smith (01/31/95);*
" *Ambient Water Quality Criteria, (AWQC)1994;*
^ *Maximum Contaminant Level / Maximum Contaminant Level Goal.*

Table 9 - The conversion of the sample identification numbers.

MDE ID#	Laboratory ID#			Remark
	Soil	Surface Water	Sediment	
S-1	95041301			Background
S-2	95041302			
S-3	95041303			
S-4	95041304			
S-5	95041305			
S-6	95041306			
S-7	95041307			Duplicate
SW-1		95041308		Background
SW-2		95041309		
SW-3		95041310		
SW-4		95041311		
SW-5		95041312		Duplicate
SED-1			95041313	Background
SED-2			95041314	
SED-3			95041315	
SED-4			95041316	
SED-5			95041317	Duplicate
B-1		95041318		Aqueous Matrix
RB-1		95041319		Aqueous Matrix

Refer to tables in the Site Inspection report for the Bloede Manufacturer Property Volume II (MDE, 1995) for a complete listing of all analites based on sampling performed on April 12, 1995.

6.2.1 Soil Sampling

Soil samples were obtained at six locations (Figure 10). Sample S-1 was designated as a background sample, and sample S-7 was a duplicate of sample S-3. All samples were grab.

Table 9 - The highest inorganic concentrations in soil samples.

CONSTITUENT	SAMPLE ID#		SAMPLE CONCENTR. (ppm)	BACKGROUND CONCENTR. (ppm)	AVAILABLE BENCHMARK (ppm)
	MDE#	CLP#			
Aluminum	S-1 (Backgr.)	95041301	22,900	22,900	NA
Antimony	S-4	95041304	26.4	<1.0	2,300*
Barium	S-4	95041304	**186**	61.0	4.1E+05*
Beryllium	S-1 (Backgr.)	95041301	0.6	0.6	**0.14****
Cadmium	S-3	95041303	0.8	<0.5	2.9E+02*
Calcium	S-6	95041306	**122,000**	3,220	NA
Chromium	S-4	95041304	**226**	38.3	2.900*
Cobalt	S-2	95041302	12.9	6.9	1.2E+05***
Copper	S-4	95041304	**332**	30.1	NA
Iron	S-4	95041304	**216,000**	29,600	NA
Lead	S-4	95041304	**1,310**	30.8	NA
Magnesium	S-6	95041306	**58,000**	2,700	NA
Manganese	S-4	95041304	**2,490**	166	2.900*
Mercury	S-7 (Dupl.)	95041307	0.3	<0.1	1.7E+02*
Nickel	S-1(Backgr.)	95041301	11.1	11.1	12,000*
Potassium	S-4	95041304	2,390	926	NA
Selenium	S-7 (Dupl.)	95041307	2.5	<0.4	1.0E+04***
Sodium	S-4	95041304	1,040	<200	NA

Table 10 - The highest organic concentrations in soil samples.

CONSTITUENT	SAMPLE ID#		SAMPLE CONCENTR. (ppm)	BACKGROUND CONCENTR. (ppm)	AVAILABLE BENCHMARK (ppm)
	MDE#	CLP#			
BNA					
Acenaphthylene	S-1 (Bckgr.)	95041301	0.7	0.7	NA
Anthracene	S-1(Bckgr.)	95041301	1.04	1.04	1.7E+05**
Benzo(B) Fluoranthene	S-1 (Background)	95041301	3.44	3.44	NA
Benzo(a) Anthracene	S-1 (Background)	95041301	2.49	2.49	NA
Benzo(a) Pyrene	S-1 (Background)	95041301	3.55	3.55	**0.08****
Benzo(g.h.i) Perylene	S-1 (Background)	95041301	2.59	2.59	NA
Benzo(k) Flouranthene	S-1 (Background)	95041301	3.36	3.36	NA
Chrysene	S-1 (Bckgr.)	95041301	3.84	3.84	NA
Fluoranthene	S-6	95041306	**0.60**	--	NA
Indeno(1,2,3-cd)Pyrene	S-1 (Background)	95041301	2.28	2.28	NA
Pyrene	S-4	95041304	3.08	--	1.7E+04**
ORGANICS					
Aldrin	S-1 (Bckgr.)	95041301	0.0074	0.0074	0.34***
Aroclor 1254	S-6	95041304	**0.70**	0.029	NA
4,4'-DDE	S-1 (Bckgr.)	95041301	0.021	0.021	17***
4,4'-DDT	S-1 (Bckgr.)	95041301	0.056	0.056	1.7**
Delta BHC	S-3	95041303	0.014	NA	NA
Dieldrin	S-6	95041306	0.55	0.054	**0.036****
Endrin Aldehyde	S-5	95041305	0.042	NA	NA
VOA					
Acetone	S-2	95041302	6.8	5.0	5.8E+04*

The soil samples at the Bloede Manufacturing site may be characterized as follows:

- Contamination was found in all soil samples collected from the area where the former Bloede Manufacturing facility was located;
- Both organic and inorganic contamination were detected;
- Numerous organic and inorganic constituents have been encountered at concentrations above their background value;
- Eight inorganic constituents -- barium, calcium, chromium, copper, iron, lead, magnesium, and manganese, mostly in sample S-4 -- have concentrations greater than three times their background values (see Table 9);
- Two organic constituents -- fluoranthene and aroclor 1254, both of them in sample S-6 -- have concentrations greater than three times their background values (see table 10);
- One inorganic constituent -- beryllium, in sample S-1 -- and two organic constituents -- benzo(a)Pyrene and dieldrin, in sample S-1 and S-6, respectively -- have concentrations above the benchmarks in SCDM, Cancer Risk Concentration Screen, Version 1994 (see Table 10);
- The most heavily contaminated soil samples are S-1 (organic contamination) and S-4 (inorganic contamination).

The potential human targets include the residents near the site and trespassers who may be visiting the site. Potential exposure pathways include dermal contact with soil/sediment and incidental inhalation and ingestion of fugitive dust from soil,

6.2.2 Surface Water and Sediment Sampling

6.2.2.1 Surface Water Samples

Surface water samples and sediment samples were obtained from the same location. There were four locations from where samples were collected (Figure 10). The sample SW/SED-1 was designated as a background sample, and sample SW/SED-5 was a duplicate of sample SW/SED-2.

Table 11 - The highest inorganic concentrations in surface water samples.

CONSTITUENT	SAMPLE ID#		SAMPLE CONCENTR. (ppb)	BACKGROUND CONCENTR. (ppb)	AVAILABLE BENCHMARK (ppb)
	MDE#	CLP#			
Aluminum	SW-4 (Dupl.)	95041311	**1,300**	270	NA
Iron	SW-3	95041310	1.2E+03	1,000	**1,000"**
Lead	SW-3	95041310	4.0E+00	3	**3.2"**
Magnesium	SW-1 (Bckgr.)	95041308	13,600	13,000	NA
Manganese	SW-1 (Bacgr.)	95041308	210	210	6,500*
Potassium	SW-3	95041310	3,050	2,750	NA
Sodium	SW-3	95941310	21,700	18,800	NA

No organic contamination was detected in surface water samples.

The surface water samples at the Bloede Manufacturing site may be characterized as follows:

- Only inorganic contamination was found;
- No contamination was detected in sample SW-2;
- One inorganic constituent -- aluminum, in sample SW-4 (duplicate) -- has a concentration greater than three times its background value (see Table 11);
- Two inorganic constituents -- iron and lead, both of them in sample SW-3 -- have concentrations above the benchmarks in Ambient Water Quality Criteria, 1994 (see table 11);
- The most heavily contaminated surface water sample is SW-3.

6.2.2.2 Sediment Samples

Table 12 - The highest inorganic concentrations in sediment samples.

CONSTITUENT	SAMPLE ID#		SAMPLE CONCENTR. (ppm)	BACKGROUND CONCENTR. (ppm)	AVAILABLE BENCHMARK (ppm)
	MDE#	CLP#			
Aluminum	SED-1 (bckgr.)	95041313	77,710	77,710	NA
Arsenic	SED-2	95041314	2.6	1.5	NA
Barium	SED-1 (bckgr.)	95041313	34.4	34.4	NA
Calcium	SED-2	95041314	13,400	12,000	NA
Chromium	SED-4	95041316	61.6	37.9	NA
Cobalt	SED-1 (bckgr.)	95041313	10.7	10.7	NA
Copper	SED-4	95041316	26.3	24.5	NA
Iron	SED-2	95041314	23,000	18,000	NA
Lead	SED-4	95041316	53.5	36.9	NA
Magnesium	SED-2	95031314	8,180	6,300	NA
Manganese	SED-1 (bckgr.)	95041313	358	358	NA
Nickel	SED-1 (bckgr.)	95041313	18.5	18.5	NA
Potassium	SED-4	95041316	644	412	NA
Vanadium	SED-2	95041314	43.3	41.1	NA
Zinc	SED-1 (bckgr.)	95041313	77.1	77.1	NA

Table 13 - The highest organic concentrations in sediment samples.

CONSTITUENT	SAMPLE ID#		SAMPLE CONCENTR. (ppm)	BACKGROUND CONCENTR. (ppm)	AVAILABLE BENCHMARK (ppm)
	MDE#	CLP#			
BNA					
Chrysene	SED-5 (dupl.)	95041317	0.47	--	NA
Fluoranthene	SED -5 (dupl.)	95041317	0.84	0.36	NA
Phenanthrene	SED-5 (dupl.)	95041317	0.48	--	NA
Pyrene	SED-5 (dupl.)	95041317	0.76	0.43	NA
ORGANICS					
Alpha BHC	SED-3	95041315	0,013	--	NA
Beta BHC	SED-1 (bckgr.)	95041313	0.010	0.010	NA

The sediment samples at the Bloede Manufacturing site may be characterized as follows:

- Both organic and inorganic contamination were detected at concentrations less than three times their available background values;
- No significant organic contamination was detected in sediment samples SED-2 and SED-4;
- No significant inorganic contamination was detected in sediment sample SED-4.

7 TOXICOLOGICAL EVALUATION

7.1 Summary

The Bloede property site is part of a commercial area of the Southwestern section of Baltimore City. The Bloede property was the former site of a glue factory. Occasional reports of dumping activities by the manufacturer were reported. Presently, the site is abandoned, and is a popular place for nuisance dumping of municipal waste.

Samples were initially screened using EPA Region III Risk Based Concentrations (RBC) values for residential soil, EPA recommended aquatic water quality criteria (AWQC) and Maryland water quality standards for contaminants in surface water. RBC values for soils were applied to sediments because no sediment guidelines have been developed. This is a conservative approach because frequent contact with sediment is much less likely than for soils.

Based on the past history of industrial open dumping and nuisance dumping, there may be a possibility of groundwater contamination. Until groundwater sampling takes place, the impact and risk associated with consumption of groundwater surrounding the Bloede Property site is unknown.

A total of seven soil samples were collected. Six soil samples, including a duplicate, was collected on-site. A background soil sample was collected in a empty lot, north of the site. The maximum concentrations of polycyclic aromatic hydrocarbons (PAHs), dieldrin, beryllium, and manganese exceeded their respective benchmarks for residential soil. In addition, lead was detected over 400 mg/kg, which is the EPA screening concentration for hazardous waste sites.

A total of five surface water and sediment samples were collected. A background surface water and sediment sample was collected upstream of the site, in Maiden Choice Run. Maiden Choice Run eventually flows into Gwynn Falls, which flows into the Patapsco River, and eventually into the Chesapeake Bay. No organic or inorganic contamination was detected in the surface water with the exception of a slightly elevated concentration of lead. Lead was detected at 4 $\mu g/\ell$ (unfiltered sample), which exceeded EPAs AWQC and Maryland water quality standard for the protection of aquatic life in freshwater from chronic exposure of 3.2 $\mu g/\ell$ for dissolved lead, for 100 mg/ℓ $CaCO_3$. No organic contamination above RBC values for residential soil was detected in sediment samples. The maximum concentration of arsenic in the sediment slightly exceeded the RBC for residential soil, but was below natural background elemental levels for the Eastern United States (9).

The following exposure scenario will be used to quantitatively evaluate risk from contaminated soil at the Bloede property site. Although the site is fenced, access is easily

gained by foot through the front gate. Spent shotgun shells are evidence of adult trespassing (hunting activities) at the site. Additionally, older children are assumed to trespass onto the site to take part in recreational activities. Therefore, it is assumed that a 70 kilogram adult trespasses onto the site 43 times per year, for 6 years and incidentally ingests 100 milligrams of soil per event due to inadvertent wiping of the mouth, dust ingestion, and hand to mouth activity (7). Additionally, it is assumed that a 35 kilogram older child will trespass onto the site 152 times a year, for 6 years and incidentally ingest 200 milligrams of soil a day (7).

In summary, systemic risk estimates to adult trespassers is low and the HI for child trespassers slightly exceeds 1. The Hazard Index (HI) for adults is 0.08 and for children is 1.1. A HI estimate above 1 indicates that adverse health effects are expected as a result of the assumed exposure scenario. The cancer risk for child trespassers is 2.0E-06. The cancer risk for adult trespassers is 1.0E-07. The cancer risk estimates for both adult and child trespassers falls within the EPA acceptable cancer risk range.

7.2 *Supporting Data*

7.2.1 Soil

A total of seven soil samples were taken. PAHs, dieldrin, beryllium, and manganese were detected at concentrations which exceeded their respective RBC for residential soil. In addition, elevated concentrations of lead were detected in the soil.

Organics

Polycyclic Aromatic Hydrocarbons (PAHs)
Elevated concentrations of PAHs were detected both in on- and off-site soil. With the exception of floranthene which was detected at S-6, the background sample of soil contained the highest concentrations of PAHs from the sampling event. Benzo(a)pyrene was detected at a maximum concentration of 3.55 mg/kg in the background sample (S-1), which exceeds the RBC value of 0.088 mg/kg, that is based on carcinogenic effects. Benzo(a)pyrene was detected at a maximum concentration of 0.900 mg/kg in on-site soil (S-4), which also exceeds the RBC value of 0.088 mg/kg.

PAHs are a group of chemically similar compounds that are found naturally and are a result of human activity (incomplete burning of fossil fuels). There are over 100 PAH's, but benzo(a)pyrene is by far the most researched because of the early recognition of its carcinogenicity. PAHs have been investigated for both systemic and carcinogenic potential. Certain PAHs have been shown to cause adverse health effects in animals. Serious reproductive and developmental effects in animals associated with acute oral exposure have been reported. Non-cancer effects noted from longer term oral exposures

of animals include increased liver weight and aplastic anemia. High doses of some PAHs have been shown to cause adverse effects in the gastrointestinal tract. An increased incidence of melanosis of the colon and rectum were observed in human volunteers who ingested laxatives containing anthracene (2).

Table 14 - Comparative Systemic Risk of PAHs in On-Site and Off-Site Soils

PAH detected	ADD (mg/kg/day) BACKGROUND		ADD (mg/kg/day) ON-SITE		RfD mg/kg/day	H.Q. BACKGROUND		H.Q. ON-SITE	
	adult	child	adult	child		adult	child	adult	child
anthracene	1.8E-07	2.5E-06	6.7E-08	9.5E-07	3.0E-01	6.0E-07	8.0E-06	2.0E-07	3.0E-06
acenaphthene	3.4E-08	4.8E-07	5.0E-08	7.1E-07	6.0E-02	6.0E-07	8.0E-06	8.0E-07	1.0E-05
fluoranthene	1.4E-06	2.0E-05	4.8E-07	6.8E-06	4.0E-02	3.0E-05	5.0E-04	1.0E-05	2.0E-04
fluorene	8.4E-08	1.2E-06	5.0E-08	7.1E-07	4.0E-02	2.0E-06	3.0E-05	1.0E-06	2.0E-05
pyrene	1.7E-08	2.4E-05	5.2E-07	7.3E-06	3.0E-02	6.0E-05	8.0E-04	2.0E-05	2.0E-04

Many PAHs have been shown to be carcinogenic in studies with laboratory animals following dermal application. The PAHs which have been shown to be dermal carcinogens in animals include benz(a)anthracene, benzo(a)pyrene, benzo(a)fluoranthene, benzo(j)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Some PAHs have also exhibited carcinogenic potential in animal studies after oral administration. These include benz(a)anthracene, benzo(a)pyrene, and dibenzo(a,h)anthracene. EPA has classified six PAHs as Group B2 (probable human) carcinogens based on a weight of evidence cancer classification scheme. These include benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, and indeno(1,2,3-cd)pyrene (2).

Table 15 - Relative Potency Calculations for On-Site and Off-Site PAHs in Soils

PAH Detected	Concentration detected (μg/kg)		R.P.C.	Relative Potency Con. (μg/kg)	
	Bckgd.	On-site		Bckgd.	On-site
benzo(a)pyrene	3,550	900	1	3,550	900
benz(a)anthracene	2,490	1,220	0.1	249	122
benzo(b)fluoranthene	3,440	900	0.1	344	90
benzo(k)fluoranthene	3,360	1,26	0.01	33.6	1.26
indeno(1,2,3-cd)pyrene	2,280	600	0.1	228	60
chrysene	3,840	1,560	0.001	3.8	1.56
Total	-	-	-	4,408	1,175

The resulting relative potency concentrations for on and off-site is 1.17 mg/kg and 4.4 mg/kg, respectively. The maximum concentrations of PAHs detected on- and off-site, assuming the exposure scenarios described in section 7.1, would not result in an increased health risk, including cancer, to trespassing adults and children.

Dieldrin

The maximum concentration of dieldrin was detected in on-site soil (S-6) at a level of 0.55 mg/kg which exceeded the EPA RBC of 0.04 mg/kg for residential soil. A concentration of 0.054 mg/kg of dieldrin was detected in the background sample.

Dieldrin is a chlorinated hydrocarbon insecticide that was used extensively on food and fiber crops to and control termites until it was taken off the American market in 1987. Because dieldrin is highly persistent in the environment, residues remain detectable in soil and sediment for many years after it is applied. Dieldrin is rarely found in surface or ground water because it does not dissolve very well in water. It is also rarely detected in air. Dieldrin is highly fat soluble and bioaccumulates in the food chain through plants growing in contaminated soil and animals that ingest these plants, soil nutrients, or underwater sediments (6).

The central nervous system is a major target of acute dieldrin toxicity. Persons who consume low levels over chronic periods can experience adverse effects such as kidney and liver dysfunction.

Similar to human findings, animal studies have found dieldrin to be toxic to the liver, immune system, central nervous system, and kidney. Animal studies have also shown dieldrin to adversely effect reproduction. Decreased survival of newborn mice, rats, and dogs born to mothers receiving low oral doses (0.125 - 0.65 mg dieldrin/kg body weight/day) prior to mating have been observed. Increased fetal deaths, and birth defects in offspring were observed for hamsters and mice administered much larger doses during pregnancy (3 - 50 mg dieldrin/kg body weight/day). Other adverse reproductive effects in animals include reduced libido, delayed estrus, and harmful maternal behavior towards newborns. EPA has established a RfD of 5.0E-05 mg/kg/day for dieldrin based on liver lesions in a chronic rodent study (1). The Average Daily Dose (ADD) for a trespassing adult is 9.3E-08 mg/kg/day, which results in a hazard quotient of 2.0E-03. The ADD for a trespassing child is 1.3E-06 mg/kg/day, which results in a hazard quotient of 3.0E-02.

Dieldrin is classified as a Group B2 carcinogen by the EPA. The Lifetime Average Daily Dose (LADD) for an adult is 7.9E-09 mg/kg/day, which results in a lifetime excess cancer risk of 1.0E-07. The LADD for a child is 1.1E-07 mg/kg/day which results in a lifetime excess cancer risk of 2.0E-06. This falls within the acceptable EPA cancer risk range.

Inorganics

Manganese

Manganese was detected at a maximum concentration of 2,490 mg/kg in on-site soil (S-4). This concentration exceeds the RBC value of 390 mg/kg for residential soil. The concentration of manganese detected in the background sample was 0.166 mg/kg.

Manganese is used in the production of batteries, ceramics, pesticides, and fertilizers. Manganese is an essential micronutrient for animals and humans. Manganese can cause adverse health effects if ingested or inhaled in large quantities. Manganese toxicity has been observed in workers exposed to high levels of airborne manganese, with effects primarily on the central nervous system (e.g., emotional disturbances, unnatural movement). Similar effects have been observed in people exposed to elevated manganese levels in drinking water (3). The EPA has developed an RfD of 5.0E-03 mg/kg/day for manganese based on a no-effect level for human exposure to manganese in water (1). The ADD for trespassing adults is 4.2E-04 mg/kg/day, which results in a hazard quotient of 8.0E-02. The ADD for children is 5.9E-03 mg/kg/day, which results in a hazard quotient of 1.0.

EPA has assigned manganese a weight of evidence classification of 'D' meaning that based on the present available epidemiological and animal data, they are unable to make a determination as to its carcinogenic potential (3).

Beryllium

Beryllium was detected in the background soil sample (S-1) at a concentration of 0.6 mg/kg which exceeded the EPA RBC of 0.15 mg/kg, based on carcinogenic effects. Beryllium was also detected in the on-site soil at a level of 0.6 mg/kg.

Beryllium is a heavy metal which is used mainly in the alloy industry. Most of the beryllium released into the environment is a result of the combustion of fossil fuel. Beryllium has shown to cause toxic effects when inhaled. Adverse health effects resulting from oral exposure to beryllium is not common, but health effects have been observed in populations exposed to high concentrations in drinking water (1). EPA has established an oral Reference Dose (RfD) of 5.0E-03 mg/kg/day based on a NOAEL derived from rats chronically exposed to 5 mg/ℓ in their drinking water (1).

The ADD for trespassing adults is estimated at 1.0E-07 mg/kg/day, which results in a hazard quotient of 2.0E-05. The ADD for trespassing children is 1.4E-05 mg/kg/day, which results in a hazard quotient of 3.0E-04.

Beryllium is classified as a group B2 (probable human) carcinogen by the U.S. EPA based on sufficient experimental data which showed statistically significant increases in cancer in rats chronically exposed to airborne beryllium. The oral cancer potency slope of 4.3 mg/kg/day was established by cross exposure route extrapolation (inhalation to ingestion) (1).

The LADD for adults is 8.7E-09 mg/kg/day, which results in an excess lifetime cancer risk of 4.0E-08. the LADD for children is 1.2E-07, which results in an excess lifetime cancer risk of 5.0E-07. The maximum detected concentration of beryllium (0.6 mg/kg) on- or off-site, would not result in an increased health risk, including cancer, to trespassing adults and children.

Lead

Lead was detected at a maximum concentration of 1,310 mg/kg in on-site soil (S-4). The concentration of lead detected in the background sample was 30.8 mg/kg (S-1). There is no available RBC value for lead in soils.

Lead is a naturally occurring inorganic element that is frequently found in small amounts in nature. Signs and symptoms of lead toxicity depend on lead concentrations in the tissue and the age of the individual. Chronic exposure to low levels of lead can interfere with the blood forming and reproductive systems, kidney function and metabolism, and produce subtle effects on personality, memory, learning, reaction time, psychomotor function, and motor coordination. Infants and young children are very sensitive to the toxic effects of lead on the nervous system. Impaired neurological development has been observed in children exposed to relatively low concentrations of lead. At higher concentrations, lead is toxic to the central nervous system and can produce neurological motor dysfunction (5).

No reference dose has been established because of the difficulty in identifying a no observed adverse effect level (NOAEL). As with most substances, lead toxicity increases with dose. EPA has classified lead as a Group B2 probable human carcinogen. EPA recommends that no numerical estimate for increased carcinogenic risk due to lead exposure be derived because of uncertainties which are unique to lead.

7.2.2 Surface Water

A total of five surface water samples were taken. A background surface water sample was taken upstream of the site in Maiden Choice Run. Lead was detected at a slightly elevated concentration of 4 $\mu g/\ell$ in a surface water sample taken southeast of the site, in Maidens Choice Run (SW-3). This concentration of lead in an unfiltered sample exceeded EPAs AWQC and the state of Maryland water quality criteria for the protection of aquatic organisms, from chronic exposure to dissolved lead. Comparisons of these values are presented in Table 14.

Table 16 - Surface Water (SW-1) Comparison

Contaminant	Maximum Concen. ($\mu g/\ell$)	Human Health, based on Fish Consumption ($\mu g/\ell$)		Protection of Freshwater Organisms, Chronic ($\mu g/\ell$)	
		EPA AWQC	MD WQS	EPA AWQC	MD WQS
lead	4.0	-	-	3.2*	3.2*

* *Calculated values are for dissolved lead, sample analysis is expressed as total lead.*

7.2.3 Sediment

A total of five sediment samples were taken. Locations of sediment soils coincided with surface water samples. A background sediment sample was taken upstream of the site in Maiden Choice Run. No organic or inorganic contamination was detected above RBC concentrations for residential soils.

7.3 Risk Summary

7.3.1 Cumulative Systemic Risk

Cumulative systemic risk to adult and child trespassers, assuming simple additivity, can be expressed as a Hazard Index (HI). The HI is calculated by the following formula: $HI = \sum(ADD_n/RfD_n)$. The estimated HI for trespassing adults incidentally ingesting soil is 0.082. The estimated HI for trespassing children incidentally ingesting soil is 1.03. A HI estimate above 1 indicates that adverse health effects are expected as a result of the assumed exposure scenario.

7.3.2 Cumulative Cancer Risk

Dieldrin was the only potentially carcinogenic contaminant which was detected on-site at a concentration higher than that of an off-site sample concentration. Therefore, with regard to site specific cancer risk, dieldrin was the only contaminant included in the cumulative quantitative assessment. The estimated cancer risks for adult trespassers is 1.0E-07. The estimated excess cancer risk for trespassing children is 2.0E-06. Both of the cancer risk estimates are within the EPA acceptable cancer risk range.

8 PROJECT PERSONNEL

The following personnel/agencies have been involved in the completion of this project:

- MARYLAND DEPARTMENT OF THE ENVIRONMENT

Environmental Restoration and Redevelopment Program:	Robert DeMarco, Program Administrator
Site Assessment/ State Superfund Division:	Arthur O'Connell, Division Chief
Project Manager:	Vas Rusu
Safety Officer:	Chris Pajak
CLP Officer:	Peggy Smith
Sampling Personnel:	Daniel Murphy, Geologist John Ortiz, Public Health Engineer Chris Pajak, Administrative Officer Robert Rothman, Geologist

Office of Health Assessment and Surveillance:

Chad Roy, Environmental Toxicologist

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NOTE: This report was written as follows:

Vas D. Rusu: Chapters 1-6, and 8;
Chad Roy: Chapter 7.

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